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UNITED STATES REGIONAL CLIMATE UPDATES

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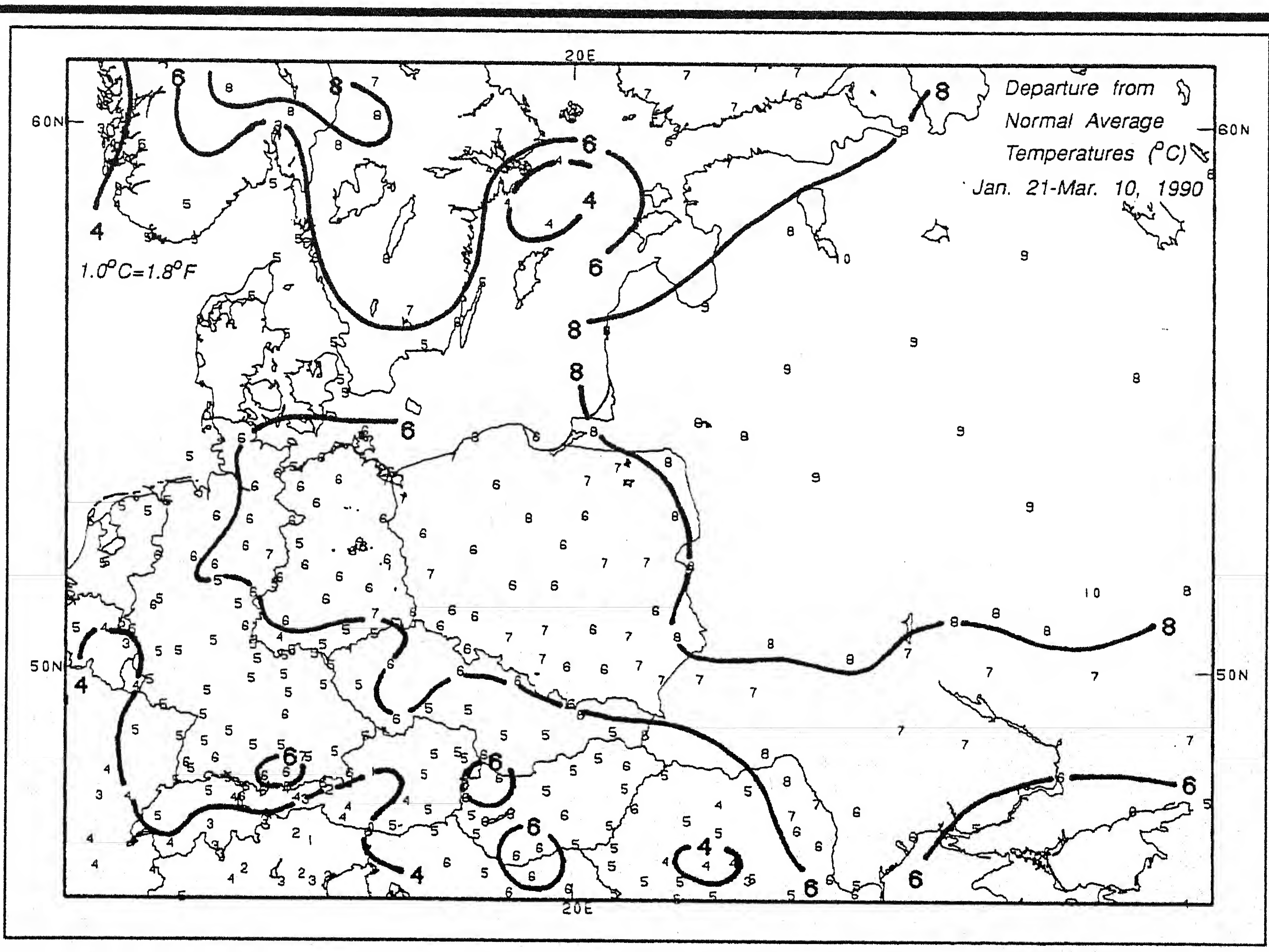
WEEKLY CLIMATE BULLETIN

No. 90/10 | Washington, DC | March 10, 1990



UNSEASONABLY MILD CONDITIONS HAVE NOT BEEN LIMITED TO THE CONTIGUOUS UNITED STATES DURING 1990. SINCE MID-JANUARY, TEMPERATURES THROUGHOUT CENTRAL, NORTHERN, AND EASTERN EUROPE AND THE WESTERN U.S.S.R. HAVE AVERAGED WELL ABOVE NORMAL. DEPARTURES HAVE APPROACHED +10°C (+18°F), AND HIGHS HAVE EQUALED OR SURPASSED 20°C (68°F) AS FAR NORTH AS CENTRAL WEST AND EAST GERMANY, SOUTHERN POLAND, AND SEVERAL LOCATIONS IN SWITZERLAND AND AUSTRIA.

UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE–NATIONAL METEOROLOGICAL CENTER
CLIMATE ANALYSIS CENTER

WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- *Highlights of major climatic events and anomalies.*
- *U.S. climatic conditions for the previous week.*
- *U.S. apparent temperatures (summer) or wind chill (winter).*
- *U.S. cooling degree days (summer) or heating degree days (winter).*
- *Global two–week temperature anomalies.*
- *Global four–week precipitation anomalies.*
- *Global monthly temperature and precipitation anomalies.*
- *Global three–month precipitation anomalies (once a month).*
- *Global twelve–month precipitation anomalies (every three months).*
- *Global three–month temperature anomalies for winter and summer seasons.*
- *Special climate summaries, explanations, etc. (as appropriate).*

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

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GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF MARCH 10, 1990

1. *Central U.S.:*

HEAVY PRECIPITATION, SEVERE WEATHER, ICE STORM OVERWHELM REGION.

Inundating rains (100 mm to 220 mm) drenched an area from northeastern Texas to eastern Arkansas while most of central and northeastern Oklahoma measured 75 mm to 170 mm. Much of the rain fell during heavy or severe thunderstorms that spawned large hail, damaging wind gusts, and a few tornadoes. Farther north, between 50 mm and 125 mm of precipitation was observed across the central Corn Belt, and one of the worst ice storms of the century in central Iowa caused widespread damage to trees and power lines. In addition, heavy snowfall was reported across the north–central Plains. Elsewhere, moderate precipitation (between 20 mm and 75 mm) kept the region abnormally wet [8 weeks].

2. *Brazil and Uruguay:*

DRIER WEATHER NORTH, MORE HEAVY RAINS SOUTH.

Light to moderate showers (10 mm to 40 mm) dampened central and eastern Brazil, but the deluge continued farther south across southern Brazil, Uruguay, and northeastern Argentina where some locations received more than 300 mm [7 weeks].

3. *Central South America:*

DRY WEATHER ENVELOPS REGION.

During the past two weeks, only 10 mm to 30 mm of rain has been observed throughout Paraguay and adjacent portions of southeastern Bolivia and northern Argentina. The recent dry weather has generated concern as it comes during a critical period of the region's growing season [2 weeks].

4. *Northern half of Europe:*

PRECIPITATION SLACKENS ACROSS MOST OF REGION.

Only light to moderate precipitation (between 30 mm and 60 mm) fell across northern continental Europe and the southern British Isles as conditions improved in the wake of the previous week's powerful storm. Scandinavia and northern portions of the British Isles, however, remained wet. Up to 205 mm of precipitation fell on parts of Norway while 50 mm to 150 mm across the remainder of the northern portions prolonged the wet spell [8 weeks].

5. *Europe, the Soviet Union, and Eastern Asia:*

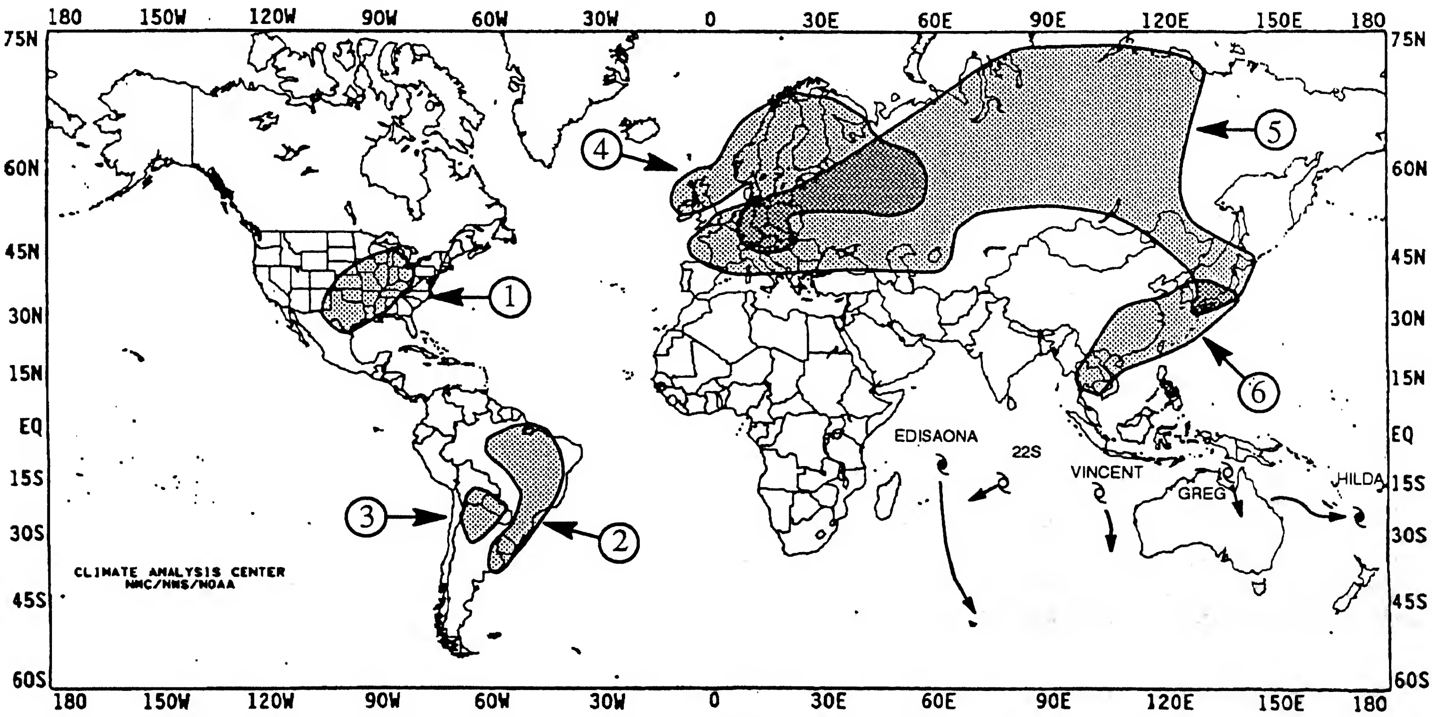
LARGE AREA REMAINS EXCEPTIONALLY WARM.

The prolonged period of mild weather continued across much of central and northern Continental Europe as temperatures averaged 4°C to 6°C above normal. In addition, a second successive week of huge positive departures (up to +19°C) across much of the Soviet Union combined with the development of unseasonably warm weather through central China and Japan to stretch the area of anomalously high temperatures across most of the northern half of Eurasia [8 weeks].

6. *Southeastern China and Honshu Island, Japan:*

EXCESSIVE RAINFALL EASES.

Most Japanese locations recorded minimal precipitation totals (10 mm to 20 mm) while China, Taiwan, and adjacent southeastern Asia also reported significantly lower rainfall amounts (20 mm to 60 mm) as the recent wet spell subsided somewhat [Ending after 5 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.

MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long–term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF MARCH 4 – MARCH 10, 1990

Abnormally mild conditions prevailed throughout the central third of the nation while subnormal temperatures were observed along the West and East Coasts. Although weekly departures were between +6°F to +16°F in the nation's midsection, wintry weather still made its presence felt in the southern and central Rockies, the north–central Plains, the western Corn Belt, and the upper Midwest during the middle of the week. More than a foot of snow blanketed higher elevations in central portions of the Rockies and Intermountain West while freezing rain, sleet, and snow glazed much of the central Great Plains and middle and upper Mississippi Valleys. According to the state climatologist, central Iowa may have experienced the worst ice storm of the century as widespread damage and power losses from fallen trees and utility poles afflicted the Des Moines metropolitan area. Meanwhile, severe weather and heavy rains hit portions of the southern Great Plains early in the week and the Midwest towards the week's end. Seasonable temperatures returned to Hawaii after a few weeks of abnormally cool weather.

As the week commenced, a Pacific storm system entered the Far West as heavy snows fell on the southern Cascades and the Sierra Nevadas and rain showers dampened coastal sections. Meanwhile, a cold front pushed southward out of Canada, reinforcing the cold air in the northern Plains, upper Midwest, Great Lakes, New England, and mid–Atlantic. By Tuesday, the storm system had tracked eastward, dumping heavy snows on parts of the Great Basin and central Rockies. This front became stationary from the middle Mississippi and lower Ohio Valleys to the mid–Atlantic Coast. A wave of low pressure developed along the front and dropped up to 5 inches of snow across northern New Jersey and southeastern New York.

By mid–week, the storm in the central Rockies slowed and intensified, generating strong thunderstorms in the southern Great Plains and widespread precipitation in the nation's midsection. Moisture overrunning the stationary front produced freezing rain from western Nebraska eastward to northern Illinois and snow farther north. On Thursday, strong thunderstorms spawned tornadoes and large hail in parts of eastern Iowa and central Illinois while high pressure remained in control along the entire East Coast, preventing the system from progressing eastward. Another storm system penetrated the Pacific Northwest Coast, bringing heavy precipitation to western Washington and Oregon.

D--ring the latter third of the week, the storm system in the
midsection trekked northeastward and weakened,
showers in the eastern Great Lakes and Ohio
her developed in western Texas while locally
nderstorms deluged southeastern Louisiana.
-like warmth prevailed throughout the
and eastern U.S. On Saturday, strong
ding a warm front in the central Corn Belt
produced torrential downpours, large hail, and a few tornadoes in parts of eastern Iowa, central Illinois, and western Indiana. Meanwhile, unsettled wintry weather continued across much of the Far West.

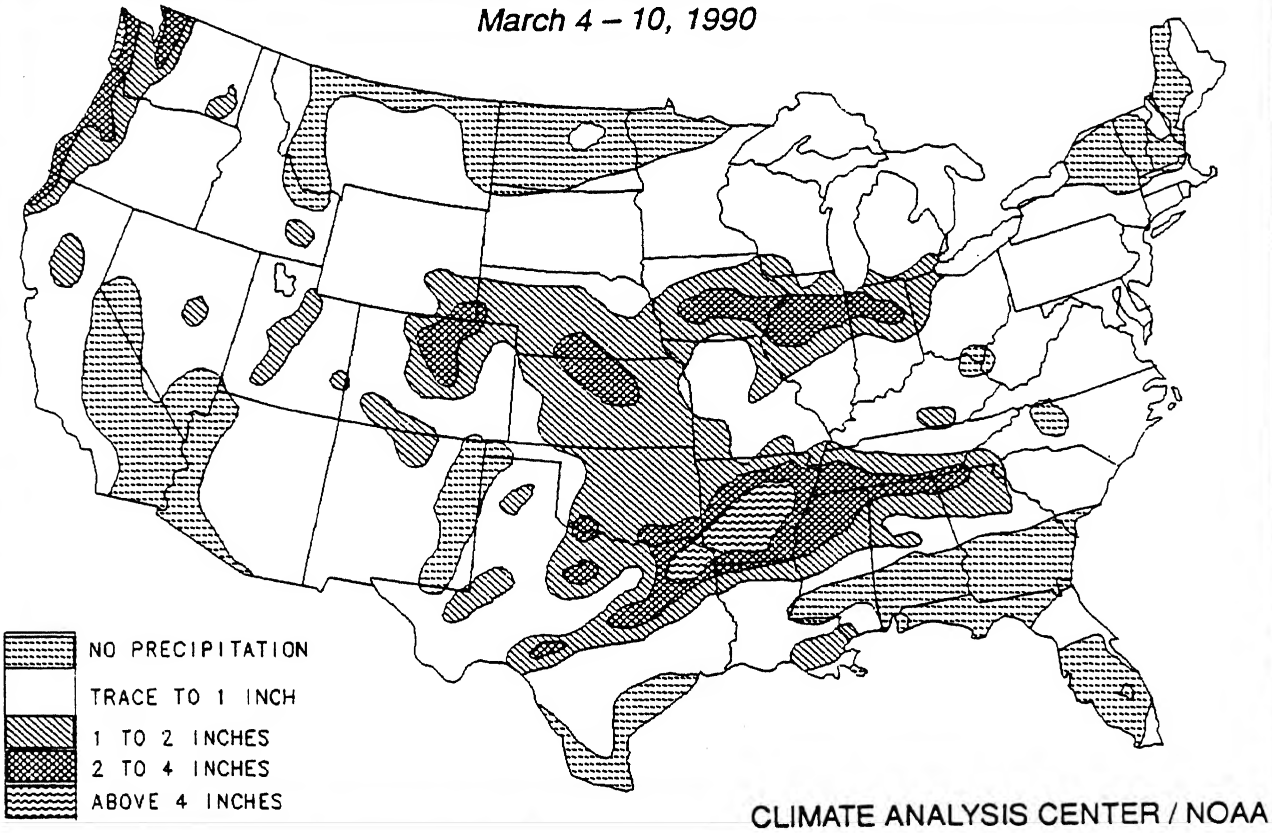
According to the River Forecast Centers, the largest weekly totals (more than 3 inches) in the contiguous U.S. occurred from northeastern Texas into southern and central Arkansas (see Figure 1), in central Oklahoma, across the central sections of Iowa, Illinois, and Indiana, and along the Pacific Northwest Coast (see Table 1). Up to 8.7 inches of rain inundated northeastern Texas and southwestern Arkansas, causing severe flooding in much of the area. Some flooding was also reported in parts of the central Corn Belt as many rivers overflowed their banks. Moderate to heavy rainfall was measured at most Hawaiian stations while light to moderate precipitation fell along the south–central Alaskan Coast.

Light to moderate amounts were also observed along the northern two–thirds of the Pacific Coast, in the northern half of the Intermountain West, across most of the Rockies, in the central and southern Plains, throughout the Midwest, in the Tennessee and lower Mississippi Valleys, southern Florida, and in portions of the Appalachians, the mid–Atlantic, and southern New England. Little or no precipitation fell on the Southwest, across the northern Plains and upper Midwest, in southern Texas, along the eastern Gulf and southern Atlantic Coasts, in sections of the mid–Atlantic and central Appalachians, and across northern New England.

Similar to January and most of February, this week's temperatures averaged much above normal throughout a large majority of the lower 48 states. The greatest positive departures (more than +12°F) were reported across the extreme northern Rockies and Plains and through the central Great Plains and lower Missouri Valley (see Table 2). Even with this week's winter storm in the Rockies, the western Corn Belt, and the upper Midwest, departures were generally between +5°F and +10°F. Towards the end of the week, several locations in the eastern half of the nation tied or set new daily maximum temperature records as spring–like warmth streaked northward. Highs in the eighties occurred as far north as southern Illinois and Indiana (see Figure 2). In Alaska, the central, southern, and eastern portions of the state observed near to slightly above normal temperatures.

In contrast, subnormal temperatures were limited to the southern half of the Pacific Coast, the central and lower Great Lakes, New England, the mid–Atlantic Coast, and western and northern Alaska. Departures below –6°F were found in northern and western Alaska and across southern New England (see Table 3). Early in the week, readings dropped below 0°F from the upper Midwest eastward to Maine, and subfreezing temperatures extended southward to northern Alabama. A few stations in southern New England established new daily record lows around mid–week.

OBSERVED PRECIPITATION
March 4 – 10, 1990



DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)
March 4 – 10, 1990

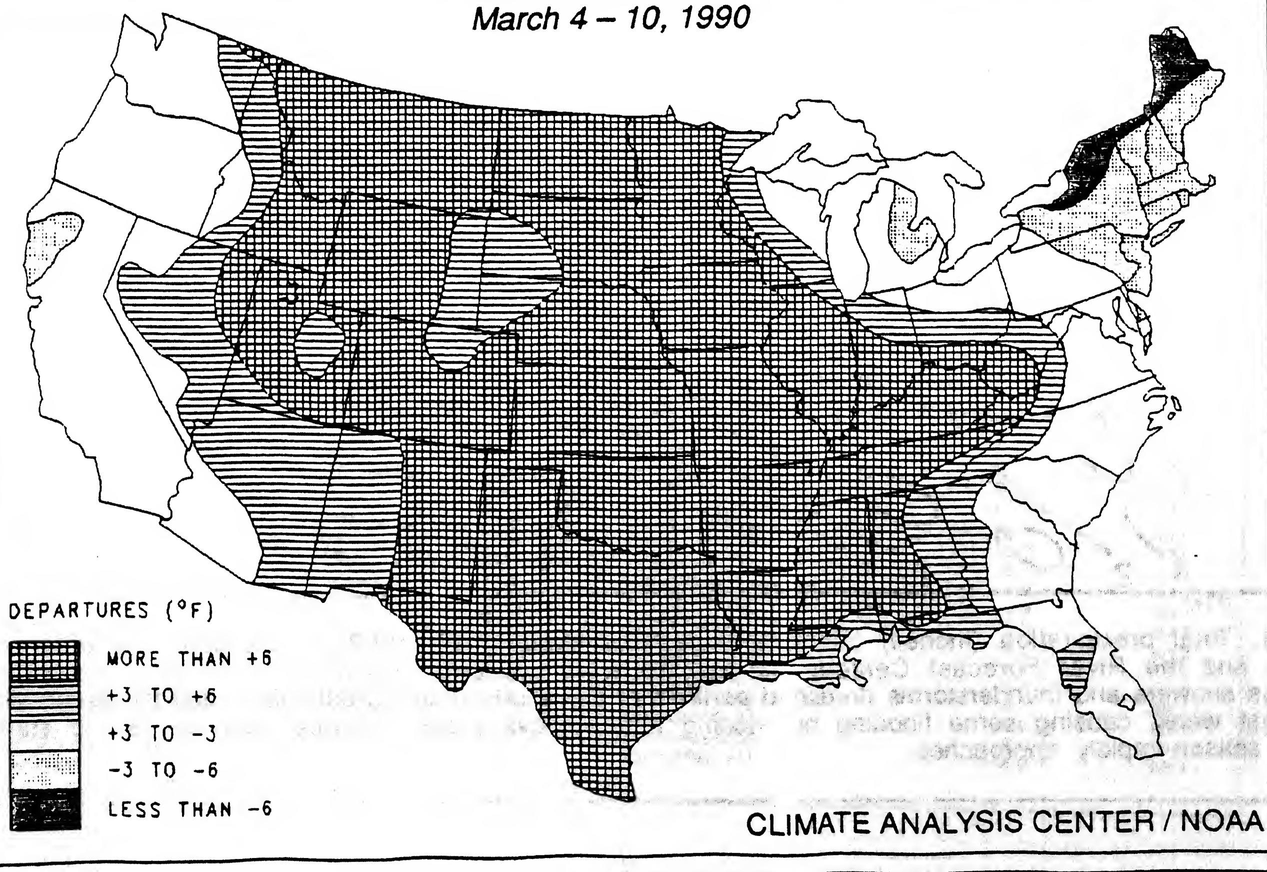


TABLE 1. Selected stations with 2.25 or more inches of precipitation for the week.

STATION	TOTAL (INCHES)	STATION	TOTAL (INCHES)
KOKEE, KAUAI, HI	9.19	ALTUS AFB, OK	2.86
QUILLAYUTE, WA	5.98	PEORIA, IL	2.84
LITTLE ROCK AFB, AR	5.71	MEMPHIS NAS, TN	2.74
EL DORADO, AR	5.53	JONESBORO, AR	2.67
LITTLE ROCK, AR	5.45	HOQUIAM, WA	2.56
YAKUTAT, AK	4.79	BURLINGTON, IA	2.54
PINE BLUFF, AR	4.60	PERU/GRISSOM AFB, IN	2.46
FORT COLLINS, CO	4.15	MEMPHIS, TN	2.45
ASTORIA, OR	3.92	CHATTANOOGA, TN	2.38
HILO/LYMAN, HAWAII, HI	3.70	JACKSON, TN	2.37
MOLINE, IL	3.59	SALINA, KS	2.33
WACO, TX	3.20	STAMPEDE PASS, WA	2.28
DES MOINES, IA	3.13	CHEYENNE, WY	2.27

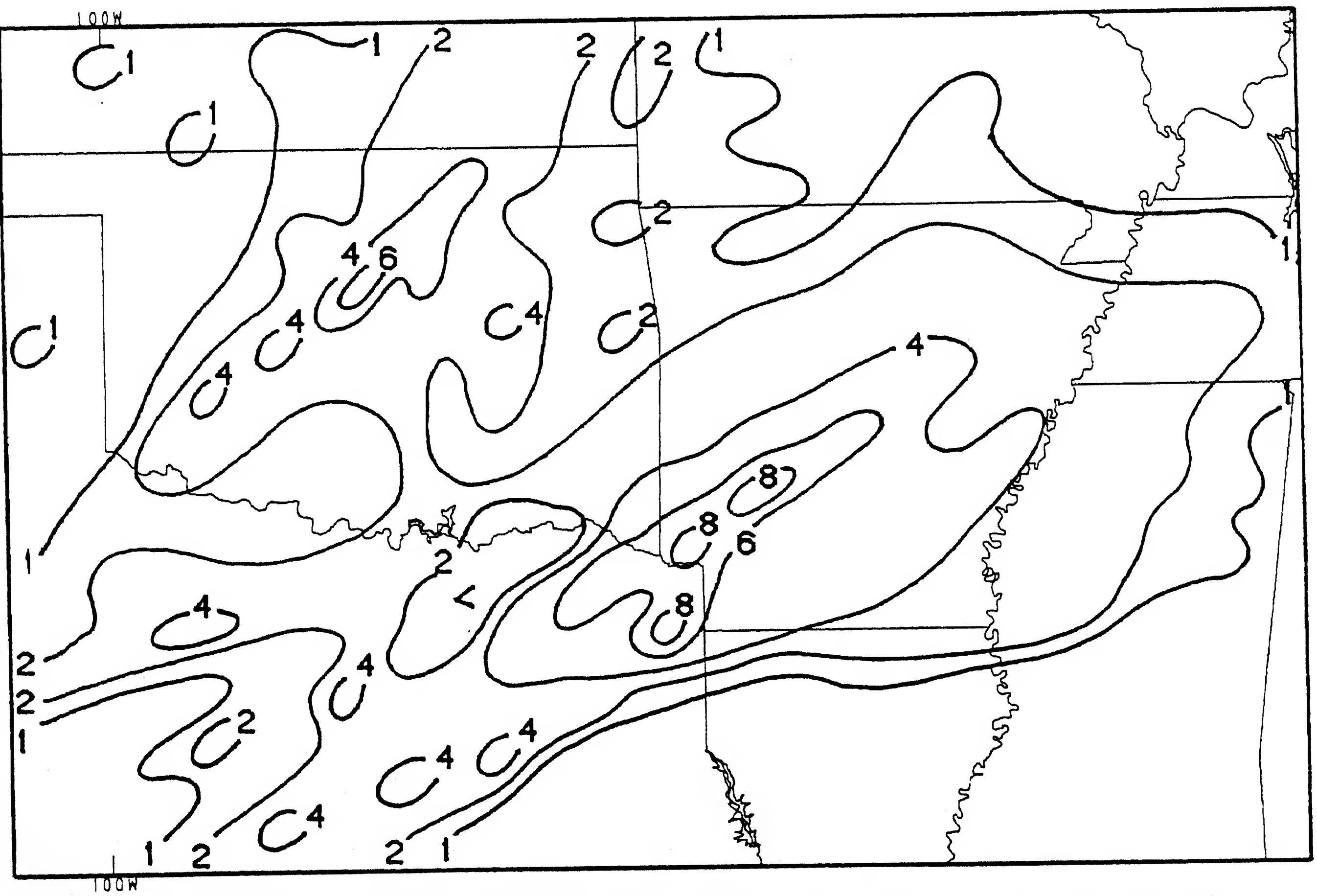


Figure 1. Total precipitation (inches) during the week of March 4-10, 1990, based upon first-order synoptic, airways, and the River Forecast Centers stations. Isohyets are only drawn for 1, 2, 4, 6, and 8 inches. Numerous showers and thunderstorms drenched portions of the south-central Great Plains and the lower Mississippi Valley last week, causing some flooding but adding to the region's soil moisture reserves as the start of the growing season rapidly approaches.

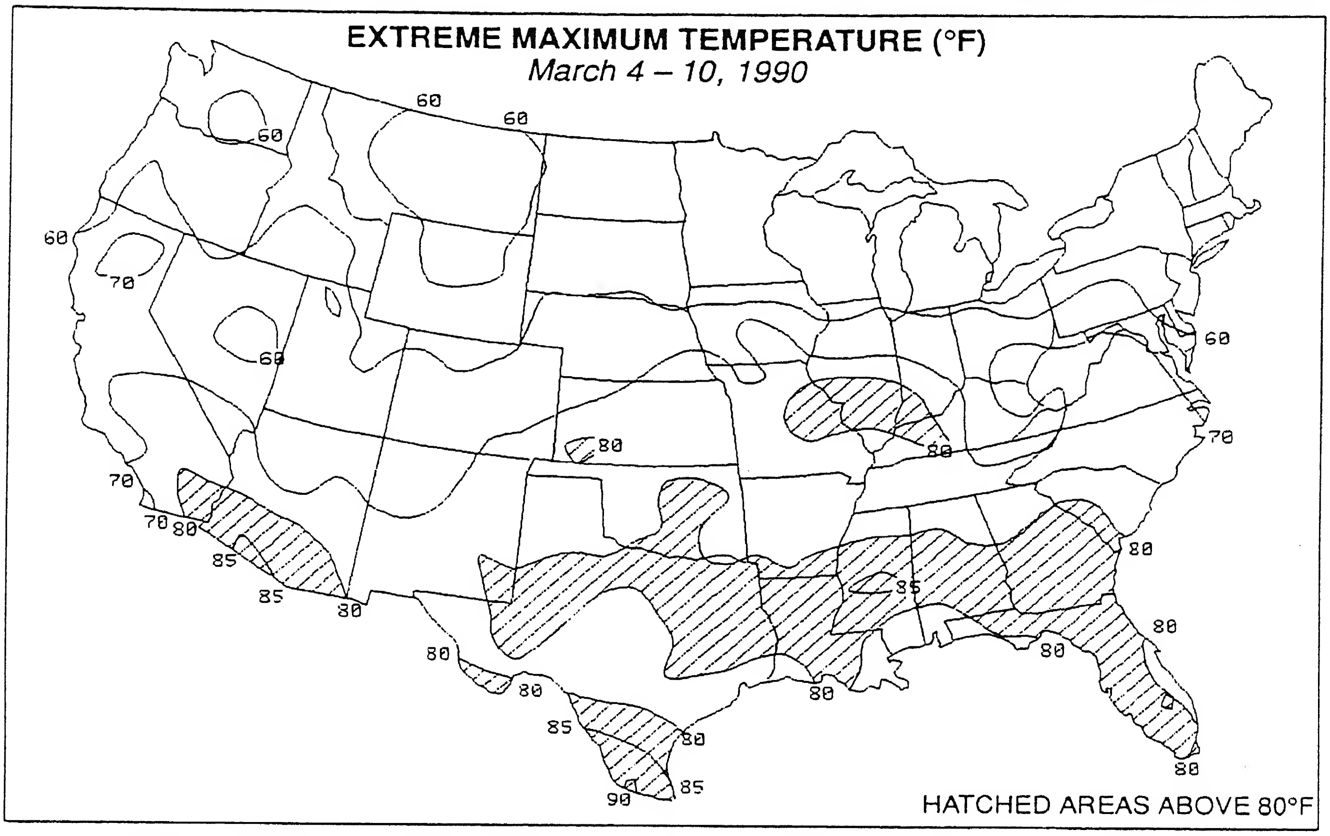


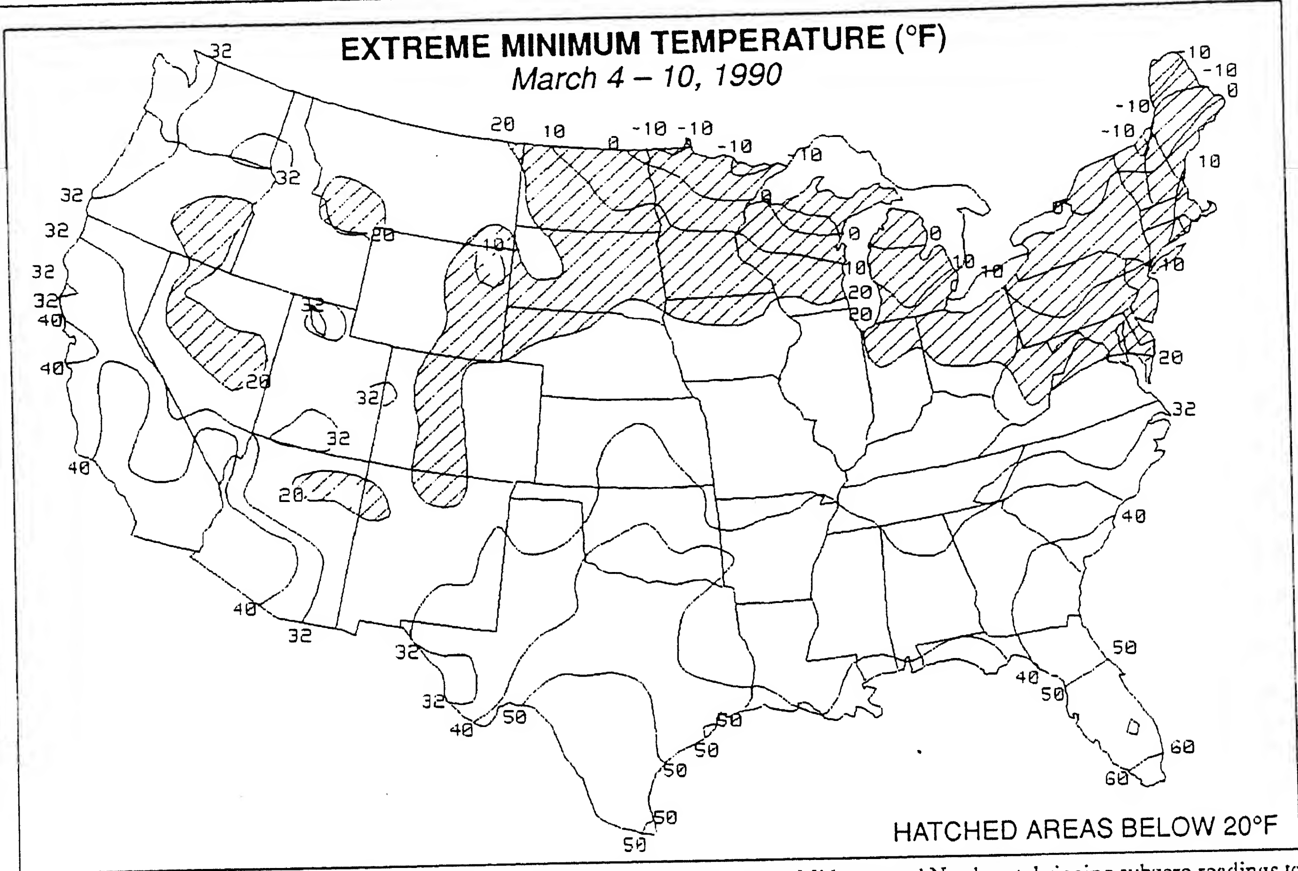
Figure 2. Extreme maximum temperatures (°F) during the week of March 4-10, 1990. Isotherms are drawn for 85°F and for every 10°F starting at 60°F and ending at 90°F. Summer-like warmth pushed northward into eastern Missouri and southern Illinois and Indiana as highs topped 80°F while seventies were common across most of the southern half of the country.

TABLE 2. Selected stations with temperatures averaging 13.0°F or more ABOVE normal for the week.

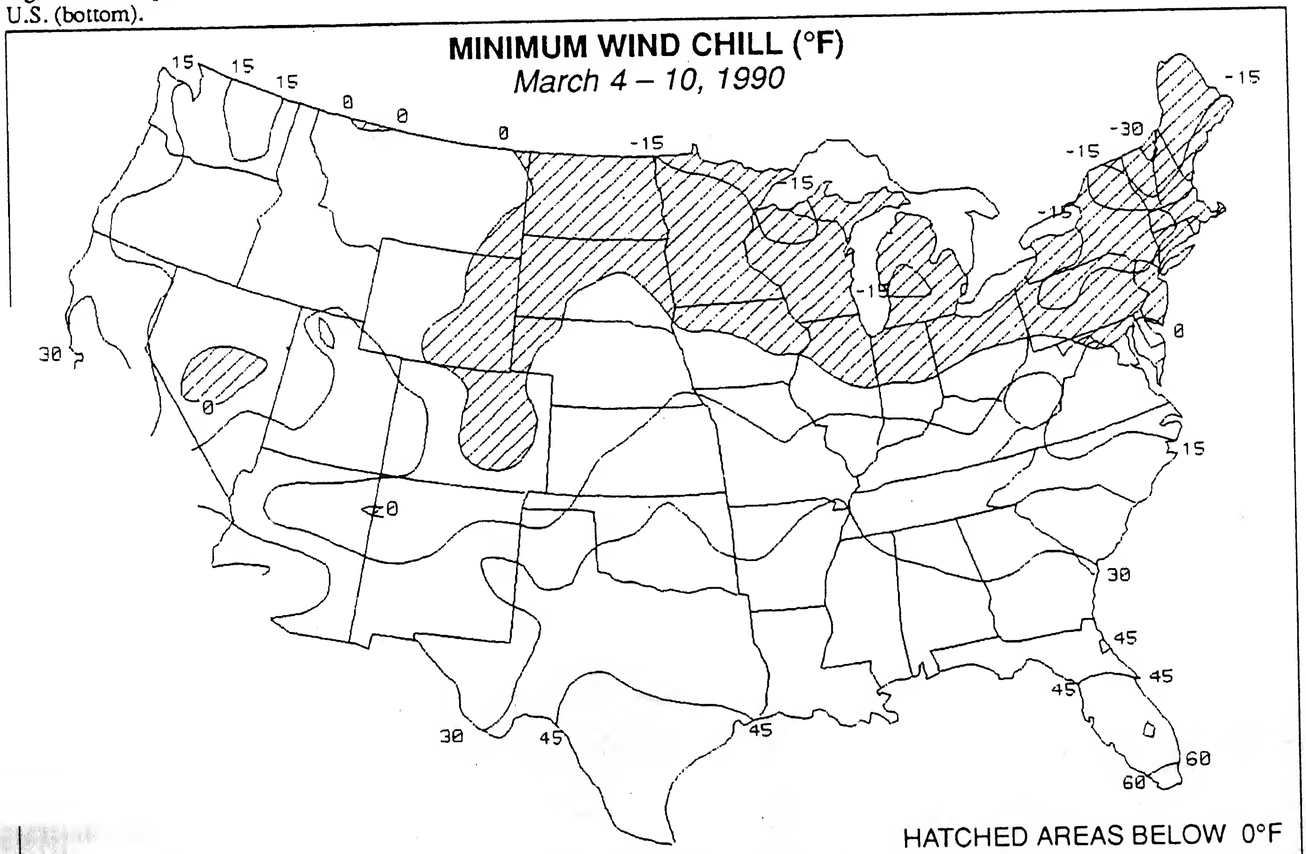
STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
ROLLA, MO	+16.3	55.7	GARDEN CITY, KS	+13.7	52.2
GLASGOW, MT	+16.3	39.8	KANSAS CITY/MUNI., MO	+13.6	53.7
SALINA, KS	+15.7	54.5	MEDICINE LODGE, KS	+13.5	56.3
JOPLIN, MO	+15.2	58.1	CONCORDIA, KS	+13.4	50.3
WILLISTON, ND	+15.0	36.8	PONCA CITY, OK	+13.3	56.6
MCALESTER, OK	+14.8	63.1	DODGE CITY, KS	+13.3	52.5
FAYETTEVILLE, AR	+14.7	58.5	CUT BANK, MT	+13.3	38.3
LEWISTOWN, MT	+14.7	40.8	WICHITA FALLS, TX	+13.1	63.5
CHANUTE, KS	+14.6	55.8	FORT SMITH, AR	+13.1	60.7
ST. LOUIS, MO	+14.6	54.3	WEST PLAINS, MO	+13.1	55.2
RUSSELL, KS	+14.5	51.9	BELLEVILLE/SCOTT AFB, IL	+13.1	52.4
HAVRE, MT	+14.3	40.4	TOPEKA, KS	+13.1	51.7
OKLAHOMA CITY, OK	+14.2	60.3	GAGE, OK	+13.0	55.9
TULSA, OK	+14.1	60.3	WICHITA, KS	+13.0	53.9
SPRINGFIELD, MO	+14.1	55.5			

TABLE 3. Selected stations with temperatures averaging 5.0°F or more BELOW normal for the week.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
NOME, AK	-9.7	-4.9	BURLINGTON, VT	-5.7	20.0
KOTZEBUE, AK	-9.7	-12.4	UTICA, NY	-5.7	22.0
MASSENA, NY	-9.5	14.7	SAGINAW, MI	-5.4	23.1
HOULTON, ME	-8.4	13.3	WILKES-BARRE, PA	-5.3	27.3
UNALAKLEET, AK	-7.8	-2.2	ATLANTIC CITY, NJ	-5.3	33.4
ISLIP, NY	-6.5	28.9	ROCHESTER, NY	-5.2	24.7
BRIDGEPORT, CT	-6.4	29.0	HARTFORD, CT	-5.2	28.5
GLENS FALLS, NY	-6.3	21.6	ALPENA, MI	-5.1	19.1
POUGHKEEPSIE, NY	-6.2	26.6	BANGOR, ME	-5.1	21.5
EASTPORT, ME	-6.1	23.0	BOSTON/LOGAN, MA	-5.1	30.1
NEW YORK/KENNEDY, NY	-6.0	31.1	AUGUSTA, ME	-5.0	23.1
SYRACUSE, NY	-5.9	23.9	PROVIDENCE, RI	-5.0	29.5
WRIGHTSTOWN/MCGUIRE AFB, NJ	-5.9	33.1	NEWARK, NJ	-5.0	33.1
MONTPELIER, VT	-5.7	18.5			

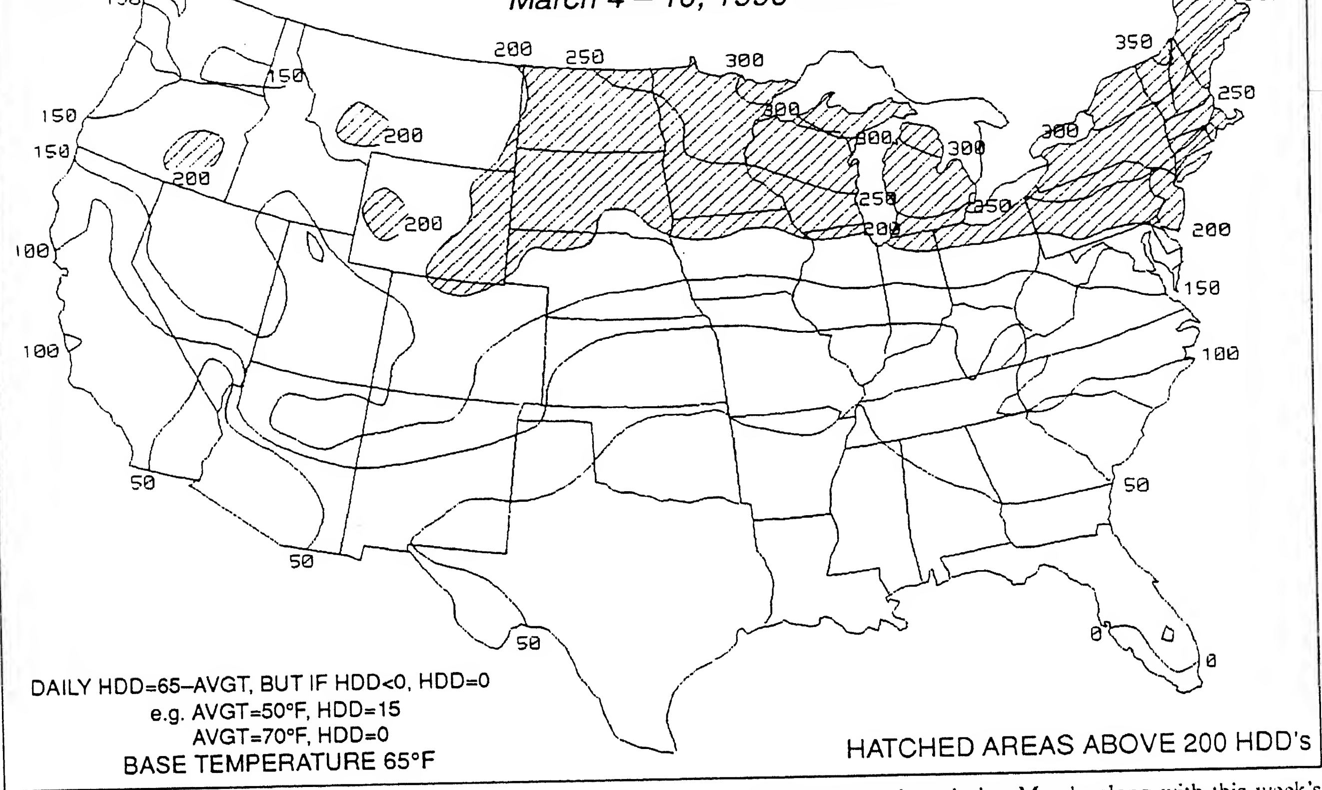


Early in the week, cold air was entrenched across the northern Great Plains, upper Midwest, and Northeast, bringing subzero readings to much of this area while subfreezing temperatures occurred as far south as northern Alabama and central North Carolina (top). Accompanying the low temperatures were gusty winds which created very cold wind chills (less than 0°F) throughout the northeastern quarter of the U.S. (bottom).



WEEKLY TOTAL HEATING DEGREE DAYS

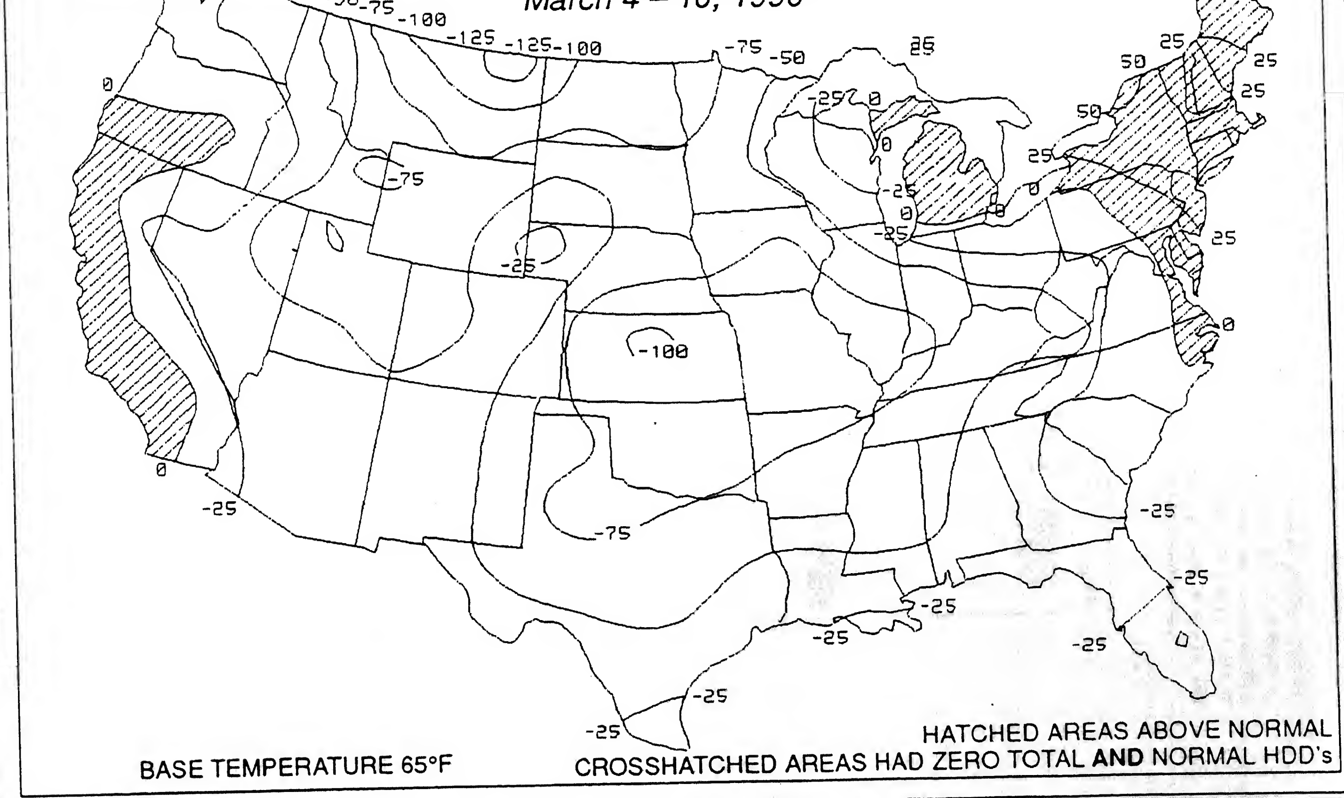
March 4 – 10, 1990



With the normal increase in temperatures and the corresponding drop in heating degree days during March, along with this week's unseasonably mild weather across most of the nation, the greatest weekly heating usage (above 300 HDD's) was limited to the upper Great Lakes and northern New England (top). While much of the country experienced elevated temperatures and reduced heating demand, California and the Northeast experienced colder than usual conditions and above normal heating demand (bottom).

WEEKLY DEPARTURE FROM NORMAL HDD

March 4 – 10, 1990



EXPLANATION OF CLIMATE ANOMALY DEPICTION CHARTS

A. FOUR-WEEK GLOBAL PRECIPITATION ANOMALIES:

The shaded areas depict regions where precipitation amounts for the four weeks during the indicated period are such that, when compared with the historical climatic record, they fall either within approximately the lowest ten percent or the highest ten percent of the smoothed historical distribution of precipitation amounts for the same calendar time period. One exception is made to this general procedure: In areas where the normal (mean) amount of precipitation for the four-week calendar period is less than 20 mm, anomalies are not depicted unless the currently reported amount of precipitation exceeds 50 mm. This exception prevents normally arid or seasonally dry regions from being depicted as anomalously dry on the chart; it also prevents wet anomalies from being depicted in such regions unless the amount of precipitation received is truly substantial.

A four week period is used for the determination of these depicted "short-term" anomalies because that is about the minimum length of time that a marked dry anomaly must exist in order for it to have a significant socioeconomic impact. (Other charts are prepared that show one, three, and twelve month precipitation anomalies in a similar manner.)

The anomalies shown on the chart are based on approximately 2500 observing stations for which precipitation reports are sufficiently complete for the period. A small number of observations are allowed to be missing or are estimated conservatively based on partial reports. Because of this, a dry bias may exist for some stations used in the analysis. As a result, the extent of dry anomalies may sometimes be overestimated and wet ones underestimated. Additionally, there are insufficient reports from some regions for determining the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. No attempt is made to depict anomalies in such regions.

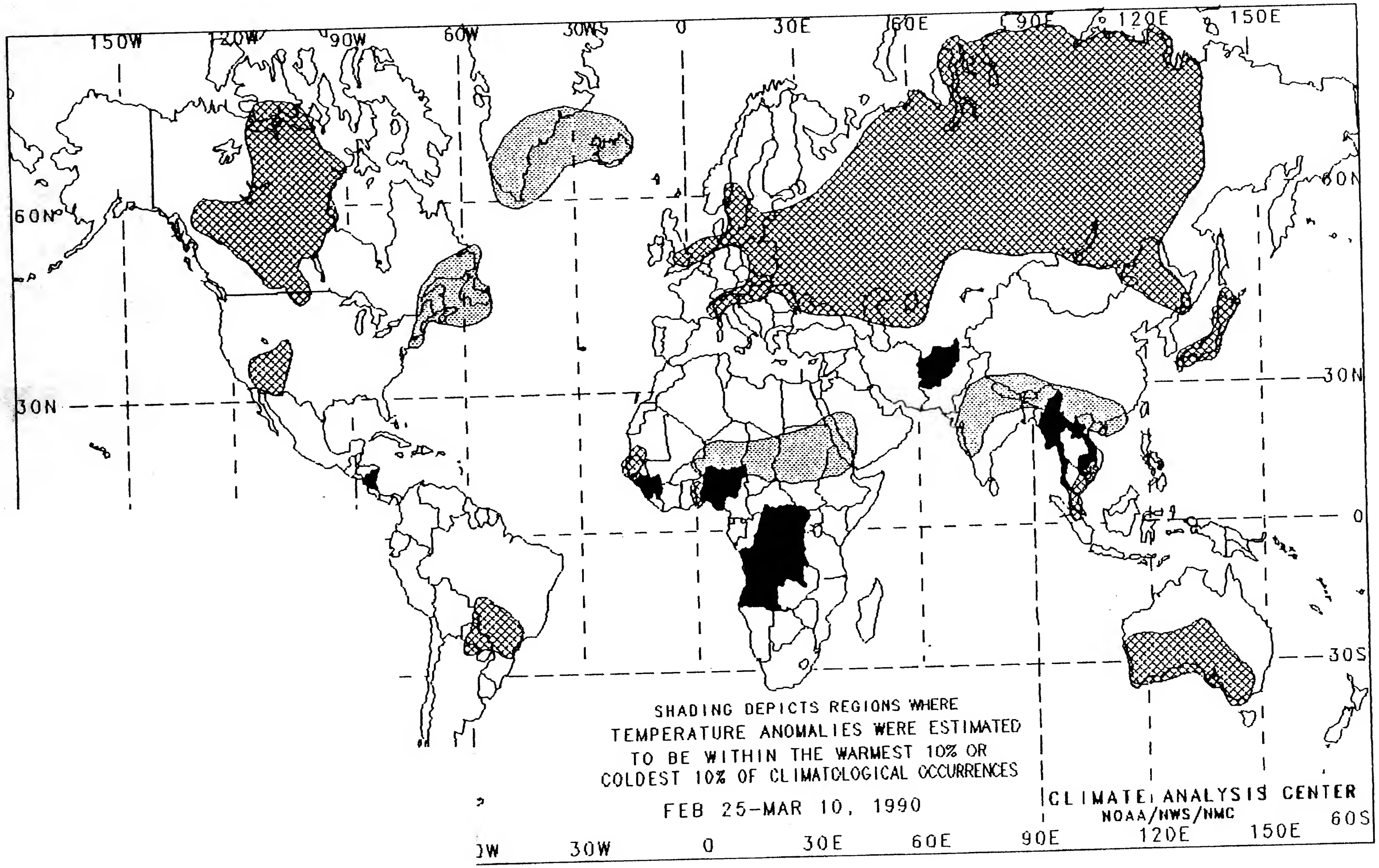
The chart shows general areas of four-week precipitation anomalies. Caution must be used in relating depicted anomalies to local conditions, especially in mountainous regions.

B. TWO-WEEK GLOBAL TEMPERATURE ANOMALIES:

The shaded areas depict regions where the mean temperature for the two weeks during the indicated period departed from the normal mean temperature for the period by enough to place the departure in either the warmest ten percent or the coldest ten percent of occurrences as determined from the smoothed climatological distribution. A two-week period is used because this period is short enough to capture major temperature excursions associated with movements of the major planetary waves of the general circulation, yet long enough to avoid the undue influence of temperature changes associated with relatively minor traveling disturbances. (Charts showing temperature anomalies for longer time periods are also prepared.) Temperature anomalies are not depicted if the departure of the temperature from normal is less than 1.5°C since smaller departures are sensitive to data errors and are usually of small economic importance. A small number of temperature observations at a station are allowed to be missing or are estimated. These may result in either warm or cold biases at some locations. In other respects, the discussion of precipitation anomalies applies equally to temperature anomalies.

GLOBAL TEMPERATURE ANOMALIES

2 WEEKS



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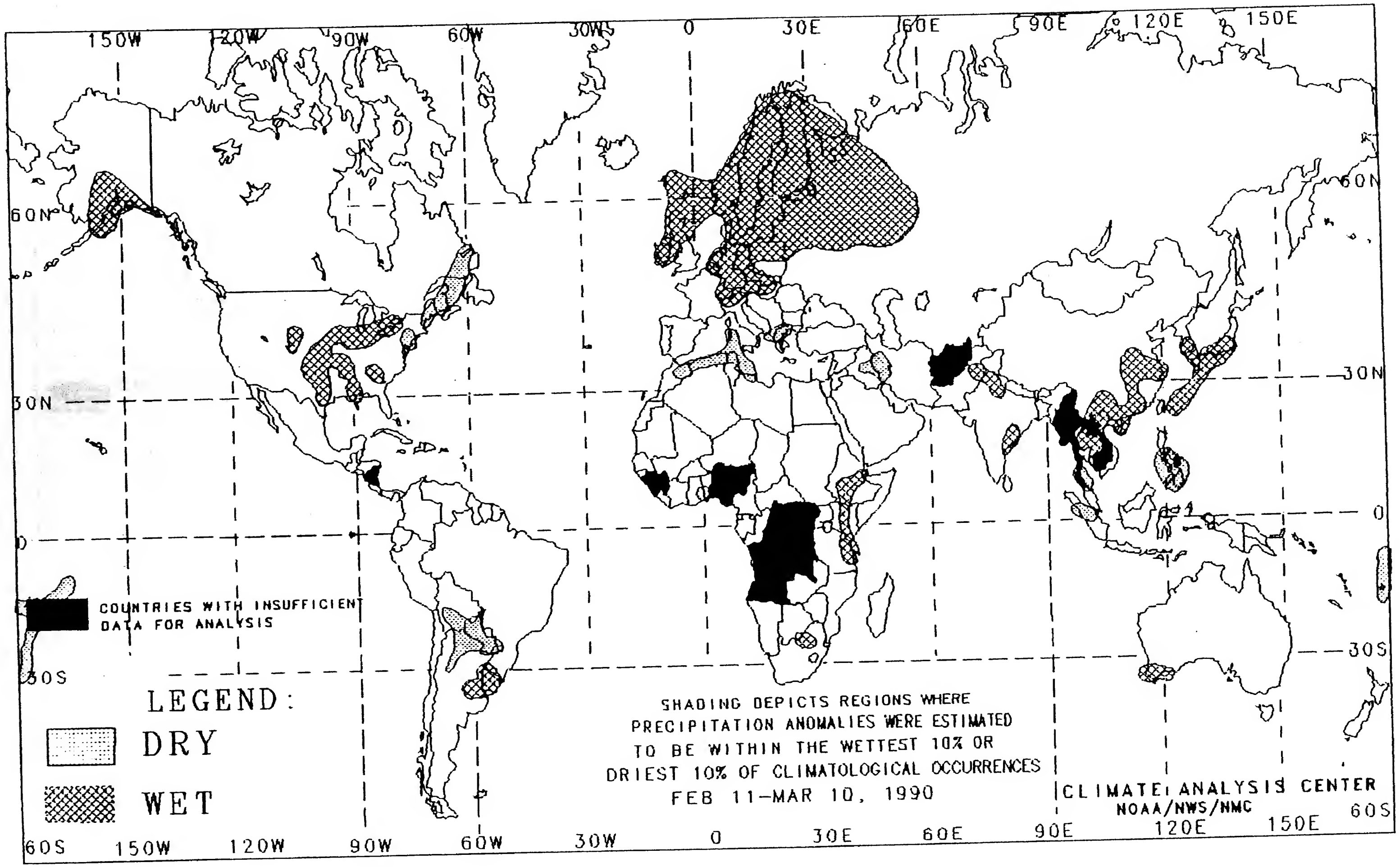
In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

GLOBAL PRECIPITATION ANOMALIES

4 WEEKS



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

UPDATES FROM THE REGIONAL CLIMATE CENTERS

Western Regional Climate Center, Reno, NV

Contact: Kelly Redmond Phone: (702) 677–3139

A relatively dry week (week ending March 5) led to small decreases in the snow water content, as a percentage of average, across the West because long–term average water content continues to rise each week at this time of year. New Mexico and Wyoming gained slightly (see Table 1).

California announced that recipients of water from the Central Valley project could expect allocations of water 50% below historical usage. This affects 309 municipal and irrigation districts, and about 20,000 farmers in the Central Valley. These cuts would be the first since 1977, and only the second time in the 50–year history of that water project that delivery of contracted water could not be made. Many orchard farmers will simply resort to keeping their trees alive until next winter without worrying about yield.

The California state water project, which supplies about a third as much water as the Central Valley project, is expecting delivery cuts of up to 28%. Los Angeles and southern California will probably receive 100% of their requested water. On Feb. 21, statewide reservoir storage stood at about 68% of the average for this date. For more information on central California water figures, refer to Table 3.

Numerous cities along the coast do not receive water from the Sierra Nevadas. In Santa Barbara, a 3–member "drought police" began to operate on February 1. After Feb. 27, fines will be assessed for wasting of water. For example, use of hoses to water cars and shrubs will be illegal, as will watering of lawns and golf courses, except with reclaimed water. Of their two primary reservoirs, Lake Gibralter, which supplies 30% of the city's water, is dry and Lake Cachuma, designed to withstand a 7–year drought, is 30% full. Although recent storms dropped 2–5 inches of rain in the catchment basin of Lake Cachuma, the lake only rose from the water that directly fell on the lake (0.1 foot) because all the rain soaked into the dry soil and no runoff into the lake occurred. On Feb. 21, the Santa Barbara county board of supervisors declared a drought emergency. Six days later, Santa Barbara became the first city this year in California, and the first city ever in southern California, to ban lawn watering. Shrubs and plants may be watered only with buckets or drip systems. Lawn watering was last banned in 1977 north of San Francisco. Water rates will also rise; the average family monthly water bill will increase from $18 to $76. Monterey and San Luis Obispo counties instituted 20% mandatory cuts, with fines up to three times the monthly water bill for exceeding allotments. Similarly, San Jose will also have mandatory rationing this summer.

Abundant precipitation in the Pacific Northwest allowed some "non–firm" surplus hydroelectric power to be generated and sold on Feb. 13 by Bonneville Power administration for the first time since summer 1989. Greatest snowpack, with respect to average, is found in the Canadian headwaters of the Columbia River. Storage behind Grand Coulee Dam and Hungry Horse Dam is 20% above average for this time of year, and over double that of a year ago. Inflow to Grand Coulee is expected to be 105% of average at the Dalles. The Snake River is expected to supply 74% of the average inflow to the Columbia, based upon current snowpack and average precipitation this spring. In eastern Oregon, runoff volume during this period is expected to be only 35–50% of average in many basins.

Recent snow has considerably aided ski resorts in much of the West, particularly in Idaho. Stevens Pass, east of Seattle, reported 20 feet of snowfall in January. Through the end of January, the U.S. Forest Service reported 40 avalanche incidents, with 56 people caught, 11 buried, 10 partly buried, 2 injured, and 2 killed. Many more have occurred during February, but statistics are unavailable until late March. Snoqualmie Pass on I–90 east of Seattle measured 220 inches of snow from January 22–February 12, and was closed by avalanche danger for nearly 5 days through February 12.

The North Platte River in southern Wyoming reported the second lowest carryover in stored water in the last 35 years, and is facing a fourth consecutive dry runoff season, with snowpack at 70–80% of average.

The driest locations in the West, namely southwest Colorado and northern New Mexico, received much–needed precipitation, and snowpack rose to about half of normal on the Rio Grande (see Table 2). Despite recent storms, much of the West recorded a drier than usual February, and water shortages will occur this summer.

Table 1

Percent of Normal

From Oct. 1, 1989–Date listed below

State	Snow Water Content				Precipitation			
	Mar5	Feb20	Feb12	Jan9	Mar5	Feb20	Feb12	Jan9
Arizona	52	75	54	42	54	58	48	41
California (Great Basin area only)	58	60	47	39	61	64	55	47
Colorado	65	67	60	67	78	79	72	67
Idaho	78	78	80	60	79	81	85	77
Montana	93	98	103	91	109	116	120	119
Nevada	70	72	65	52	67	67	61	67
New Mexico	58	59	51	39	76	75	70	65
Oregon	83	87	80	34	81	83	82	66
Utah	70	74	62	48	74	76	65	56
Washington	106	107	106	54	104	107	110	88
Wyoming	85	88	90	90	92	96	96	105
West Region (except rest of California)	80	83	79	60	85	88	86	77

WESTERN REGIONAL CLIMATE CENTER and the SOIL CONSERVATION SERVICE

Table 2

River Basin	Snow Water Content				Precipitation			
	Mar5	Feb20	Feb12	Jan9	Mar5	Feb20	Feb12	Jan9
Arkansas River	77	82	79	76	80	76	79	78
Colorado River	68	70	62	54	74	76	68	61
Missouri River	92	96	99	100	103	110	110	116
Columbia River	88	90	89	56	90	92	93	80
Rio Grande River	53	50	42	27	71	68	63	56
Great Basin	65	67	57	45	68	70	61	52

Percent of Normal

From Oct. 1, 1989–Date listed below

WESTERN REGIONAL CLIMATE CENTER and the SOIL CONSERVATION SERVICE

Table 3

Some water figures for central California, reported February 21:

A: Number of customers, millions of people

B: Reservoir percent of capacity this year

C: Reservoir normal percent of capacity this year

District	A	B	C	D
East Bay Municipal Utility Dist.	1.1	64	80	Voluntary 15%
San Francisco Water Dist./Hetch Hetchy	2.2	40	65	Voluntary
Santa Clara	1.4	14	40–50	Voluntary 25%
Marin County	0.2	60	82	Voluntary
U. S. Bureau of Reclamation Central Valley Project	*	49	71	Up to 50% cutback

* 309 contracts local and municipal water dističts, approximately 20,000 farmers.

Midwest Climate Center, Champaign, IL

Contact: Stan Changnon/Ken Kunkel Phone: (217) 244–1488

February 1990 was quite mild throughout most of the 9–state region. Precipitation varied widely, being well below normal in the northern half (north of a line from Kansas City to Milwaukee and eastward to Saginaw, MI) and much above normal south of that line. East–central Illinois and northwestern Indiana received 5–6 inches of February precipitation, more than 300% of normal, and this was the wettest February in the past 100 years in that area. Most of the lower Midwest, which includes Missouri, Illinois, Indiana, Ohio, and Kentucky, recorded between 150% and 300% of average February precipitation, and totals varied from 3–8 inches. Missouri observed its fourth wettest February ever.

In sharp contrast, the upper Midwest had minimal February precipitation, including western Iowa and most of Wisconsin and northern Michigan. In these

areas, monthly amounts were generally 0.2–0.3 inches, or less than half of normal. Overall, the February precipitation pattern continued the pattern of the past five months across the Midwest, namely dry in the north and wet in the south.

February temperatures continued the much–above–normal tendency of January. Monthly temperature departures were greater in the lower Midwest. Southern Illinois and Indiana, and most of Ohio and Kentucky reported temperatures 7°F to 9°F above normal. Kentucky and Ohio experienced its second and fifth warmest February since 1900, respectively. Positive departures were less in the northern sections, averaging only 1°F–2°F above normal near the Canadian border.

Two major storms affected the central and southern Midwest during February. A major winter storm on Feb. 14–15 produced heavy snow across northern parts of Missouri, Illinois, and lower Michigan and freezing precipitation across the central sections of these three states and Indiana. A second major winter snow and rain storm hit the southern and central sections of the Midwest on February 22–24.

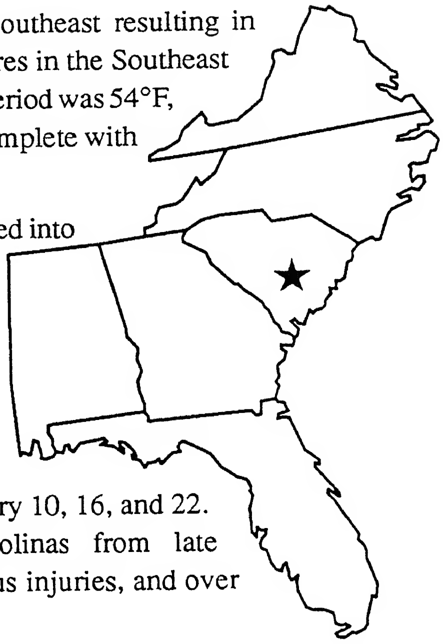
There were three major impacts produced by the weather events and climatic conditions during February 1990. The first of these results from the persistent dryness that existed over large parts of Iowa, Minnesota, Wisconsin, and upper Michigan. In Minnesota, February 1990 marked the 42nd successive month of drought. The U.S. Corps of Engineers announced that it will take 6 years of normal precipitation to restore the depleted ground and surface water conditions of this region. Hydrologic drought appears very likely to continue across much of this area through 1990.

The second major impact was the damages from the extremely severe winter storm of Feb. 14–15. This storm produced significant damage across portions of northeastern Missouri, central and northern Illinois, central and northern Indiana, lower Michigan, and northern Ohio. In Illinois, more than 100,000 tress were lost to the ice storm. Schools across the 5–state area were closed for 2–5 days, and homes and businesses suffered damage from falling trees, poles, and prolonged power outages. Heavy icing within a swath from west–central Illinois northeastward into northern Ohio did extensive damage to power lines, and power was not restored for up to two weeks in some rural areas. It also paralyzed Midwestern transportation, closing Chicago/O'Hare Airport for 20 hours. The number of people killed from this storm was 21 while the storm of Feb. 22–24 led to the deaths of 19 others.

The last weather–related impact was associated with the mild conditions. Heating costs across the region were much below normal for the second straight month, providing a benefit to consumers but causing revenue losses to the utility industry. In addition, the ice storm caused further revenue losses to the utilities as extensive replacement of poles and lines were required throughout the central Midwest.

Southeast Regional Climate Center, Columbia, SC

Contact: David J. Smith/John Purvis Phone: (803) 737–0800



January 1990 marked the beginning of a warming trend across the Southeast resulting in near–record winter warmth. The January–February 1990 average temperatures in the Southeast were unequaled since 1890. The average temperature during the two–month period was 54°F, 7.9°F above normal. The weather patterns reflected a spring–like situation complete with heavy rains, flooding, and severe weather outbreaks.

The warm spell came to an end in late February when a cold air mass settled into the region. Temperatures on Feb. 25–27 dropped into the single digits in Virginia and into the teens and twenties as far south as Georgia. The cold, dry air also brought record high pressure to portions of the East Coast. Charleston, SC reported a record high pressure of 30.85 inches on February 26.

Along with the warmth during mid–January to mid–February, several episodes of severe weather hit the area on Jan. 25–26, Feb. 4–5, and February 10, 16, and 22. Tornadoes raked Alabama, northern Florida, Georgia, and the Carolinas from late January–February as 28 confirmed twisters caused several deaths, numerous injuries, and over $20 million in property damage.

Heavy rains accompanied the severe weather, producing flash flooding and cresting rivers above flood stage in Alabama, Georgia, and the Carolinas during February. Localized intense thunderstorms generated the worst flooding in Georgia since 1951 and in Alabama since 1932. Floods were responsible for $16 million in damages in Georgia, and 12 counties were declared federal disaster areas from both the flooding and tornadoes. In Alabama, 6 counties were declared federal disaster areas as 800–2000 people were evacuated along the Coosa, Black Warrior, Tallapoosa, Alabama, Tombigbee, and Mobile Rivers during parts of February. Dredging operations have been suspended in Alabama and Georgia due to flooding and new dredging to open clogged waterways may cost $1 million.

The heavy rains have boosted soil moisture levels which have provided adequate moisture for spring pastures. The excess moisture, however, has delayed field work and early planting. Winte
of nitrogen deficiency from leaching, and the wetness has prevented top dressing of the

In sharp contrast, southern Florida is experiencing the w
with a 1989 rainfall deficit of 28.2 inches which followed a
areas were especially hard hit. Daily temperatures in Dade
Since the drought began in September 1988, the lower east
than 35 inches below normal. Mandatory water restrictic
limited outdoor water use on certain days. If the drought pe
one day a week.

The drought is creating favorable wildfire conditions a
supplies. Central and south Florida are rated as a "high risk
the worst springtime fire potential in history. Since Januar
Loxahatchee National Wildlife Refugee are leaving in se
Palm Beach County. Little water remains in the refugee due
water supply shortages have been reported outside of Flo

Late reports of impacts in Florida from the frigid December weather included a reduction in orange production by 30% while grapefruit production was decreased 15% compared to 5–year averages. This was the lowest projected orange production in 25 years (less than 94 million boxes). Florida nurseries lost $300 million worth of stock with a 50% stock loss in Dade County alone. 90% of the winter vegetable crop (tomatoes, corn, celery, etc.) was damaged. Tomato production dropped 32%, celery reduced 14%, and sweet corn fell by 35%. Marine and estuary wildlife and shellfish populations were severely affected by cold water temperatures. Shrimp populations were reduced as much as 90% from the Carolinas to Florida. Four Florida Power & Light generating plants were knocked out of service during the cold snap as the demand already exceeded the 1996 projections.

The January–February warmth lured many to areas near the Atlantic Ocean as there was a booming occupancy rate in resorts along the coasts of Virginia southward to Florida. In early February, coastal resorts reported 90% occupancy. The warmth, however, caused an erratic ski season in the southern Appalachians. Upwards to 4000 seasonal workers were released from ski areas in Virginia southward to Georgia. Two of the four ski areas in Virginia closed during January, the earliest since 1973.

The exceptionally mild January and February produced a 60% reduction from normal in the heating requirements throughout the Southeast. Consumers benefited significantly from the reduced costs of heating in 1990, but the frigid December weather easily compensated for the Jan–Feb savings. Chemical and other industries, which depend on pressurized processes, reported disruptions in operations and some equipment damages due to the record high pressure in late February.

Warm weather and adequate moisture spurred early growth and development of pastures, perennial crops, and forests from Virginia to Alabama. The dormant season for fruit trees, ornamentals, and vine crops was shortened by 3–4 weeks. Trees and shrubs began to bloom by mid–February as far north as southeast Virginia. The hastened, post–dormant growth left fruit trees, ornamentals, and other perennials highly susceptible to cold damage.

Low temperatures during the late February cold snap reached near or below critical levels for blooming trees, vines, and ornamentals. Damage to the overall peach crop was minimal and did not result in reduced production. Strawberries, blueberries, and other ground fruits which were not protected suffered the most damage. Azaleas, plums, nectarines, and crabapple trees in bloom received moderate damage. The consensus among agricultural officials was that the freeze did not significantly reduce potential fruit or vegetable production. Most of the damage occurred to early varieties, and they only represent a small portion of the overall crop. They did warn, however, that another freeze is possible anytime through late April, and if this occurs, reduced production of some fruits may result.

SPECIAL CLIMATE SUMMARY

EL NIÑO SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC ADVISORY 90/2

issued by

DIAGNOSTICS BRANCH

THE CLIMATE ANALYSIS CENTER

NATIONAL METEOROLOGICAL CENTER, NWS

March 12, 1990

All atmospheric and oceanic indices for the tropical Pacific in February consistently indicate warm (ENSO) episode conditions. Low–level westerly anomalies were observed in the central and western equatorial Pacific associated with enhanced convection (cloudiness and precipitation) near and just to the east of the date line. Consistent with the anomalous low–level wind and convective pattern, sea level pressure was anomalously high in the region of Indonesia and northern Australia and anomalously low in the central Pacific. This resulted in the lowest individual monthly value of the Southern Oscillation Index since the 1982–1983 warm (ENSO) episode (see Figure 1).

Sea surface temperatures (SST) anomalies in February increased from values observed in January throughout the central and eastern equatorial Pacific. The increase in SST anomalies from November to February is shown in Figure 2. Anomalies have increased by about 1°C during the last three months nearly everywhere along the equator east of the date line. However, sea surface temperatures in the eastern equatorial Pacific have only risen to near or slightly above normal.

The depth of the oceanic thermocline, as measured by the depth of the 20°C isotherm, increased in the eastern equatorial Pacific during the last month. This resulted from Kelvin waves, which were initiated by earlier westerly wind episodes in the central equatorial Pacific. At the same time, the depth of this isotherm has decreased in the western Pacific. The flattening of the thermocline is a feature of ENSO episodes. In February, however, strong zonal slopes in the thermocline still remained, with the deepest thermocline located along the equator in the vicinity of 175°W. A similar pattern was observed in the early stages of the 1986–1987 warm (ENSO) episode.

Superimposed on the trend towards warm episode conditions there has been a great deal of intraseasonal variability due to the Madden–Julian (30–60 day) oscillations. These oscillations in the region from 60°E eastward to near the date line and also over the equatorial western Atlantic and neighboring South America, increased in amplitude during late 1989 and have had a period of 45–60 days. In the central Pacific, there have been two periods of enhanced convection associated with the Madden–Julian oscillations. The first occurred in mid–November and was associated with significant low–level westerly winds. The second and stronger event occurred from mid–January through mid–February. Once again, strong low–level westerlies were observed in the western Pacific, but in this latter case both the low–level westerlies and the strong convection penetrated much farther east than in November.

Negative outgoing long wave radiation (OLR) anomalies (stronger than normal convection) have dominated the region around 160°W westward to the date line, and positive OLR anomalies have dominated the region from 120°E eastward to near 160°E. At the end of February, conditions were similar to those observed in late December with enhanced convection in the Indian Ocean sector and diminished convection in the central Pacific, although in the latter region it was still more active than normal.

The atmospheric and oceanic anomaly patterns indicate warm (ENSO) episode conditions. However, persistent intense convection has not yet developed in the equatorial central Pacific. Instead, there has been considerable intraseasonal variability characterized by periods of intense convection interspersed with periods of near normal convective activity. We will continue to closely monitor the situation, and an updated advisory will be issued in mid–April.

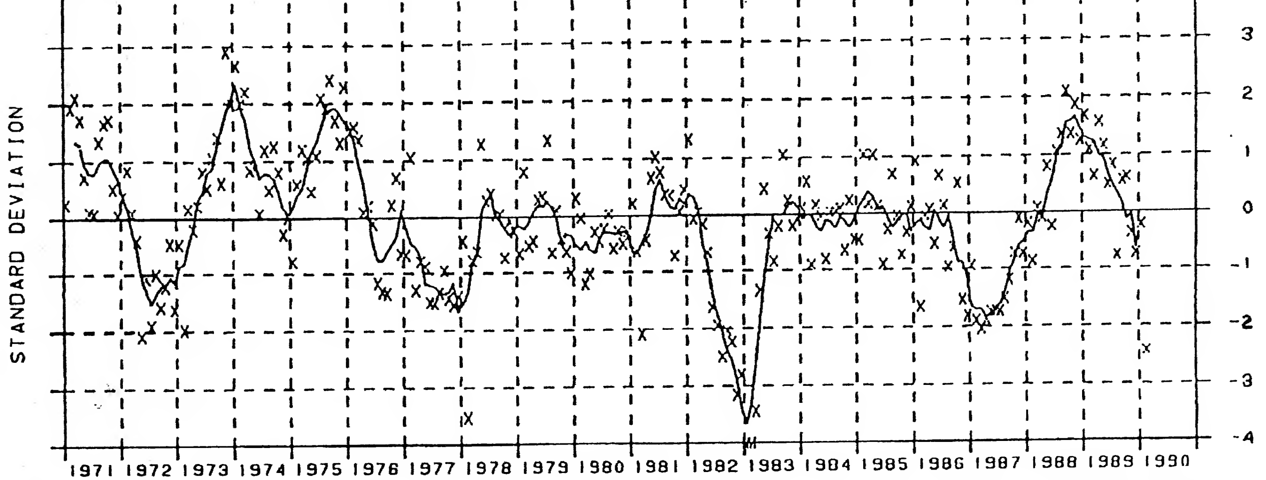


Figure 1. Five-month running mean of the difference between the standardized sea level pressure anomalies at Tahiti and Darwin (Tahiti-Darwin). Values are standardized by the mean annual standard deviation. Crosses are individual monthly means. Anomalously high February sea level pressure in the region of Indonesia and northern Australia along with anomalously low sea level pressure in the central Pacific resulted in the lowest individual monthly value of the Southern Oscillation Index since the 1982-1983 warm (ENSO) episode.

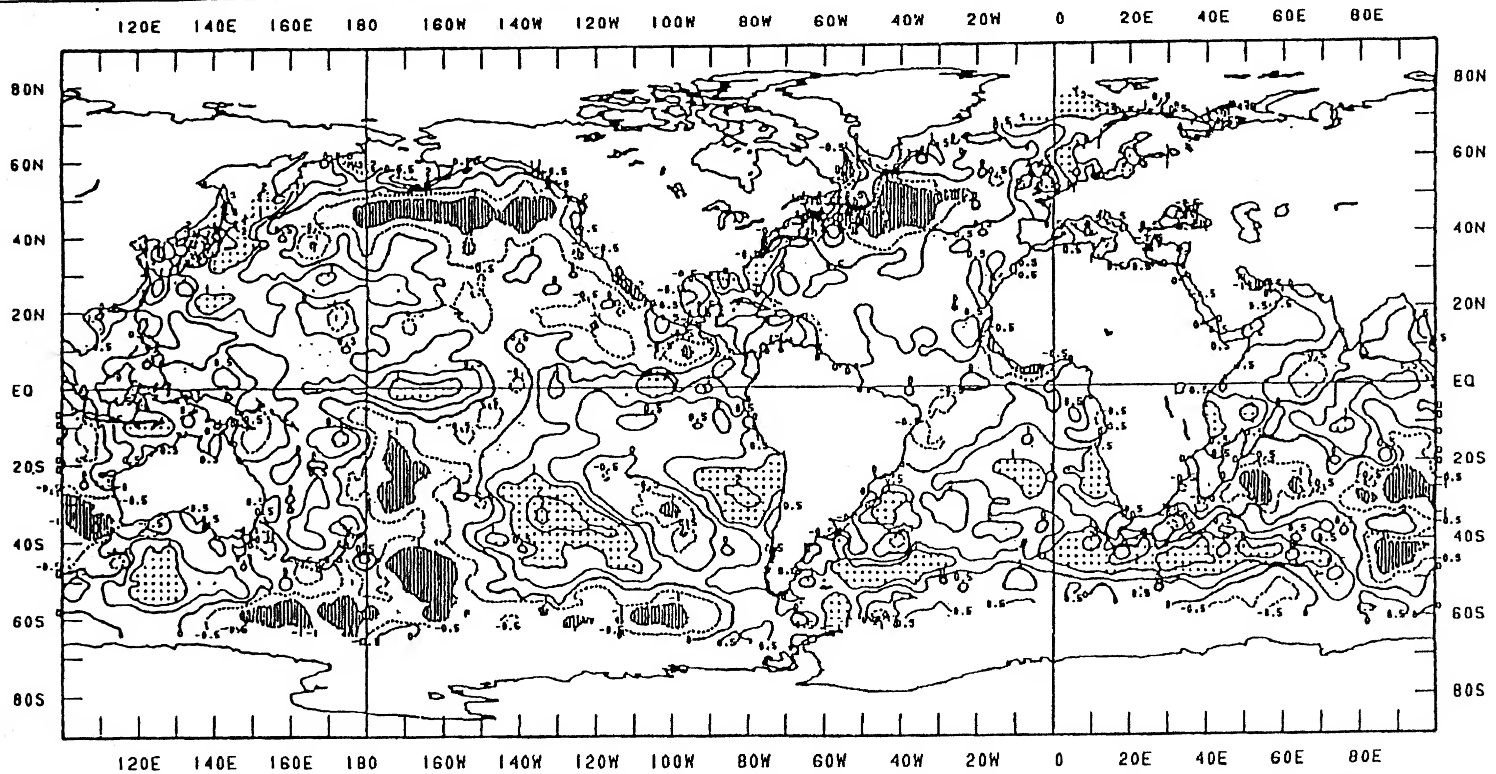


Figure 2. Difference in sea surface temperature anomalies (February 1990-November 1989). Contour interval is 0.5°C. Values greater than +1°C are dotted, and values less than -1°C are vertically hatched.